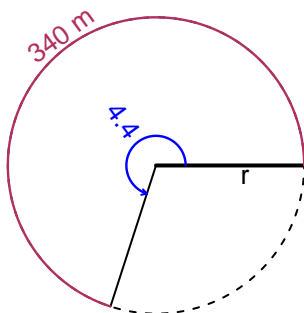# Trig Final (Solution v20)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 340 meters. The angle measure is 4.4 radians. How long is the radius in meters?
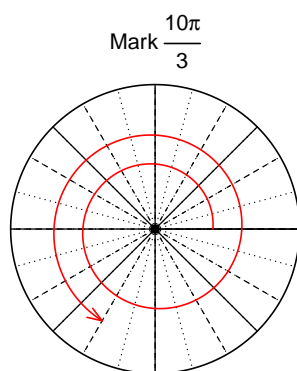

$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$
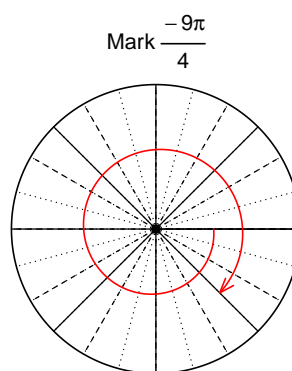
$r = 77.27$ meters.

Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{10\pi}{3}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\dfrac{10\pi}{3}$ Mark $\dfrac{-9\pi}{4}$

Find sin(10π/3)   Find cos(−9π/4)
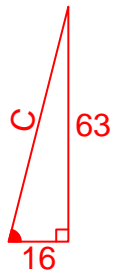
$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$ $\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-63}{16}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.
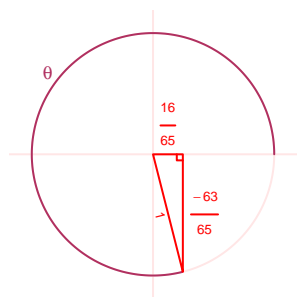
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.

Solve the Pythagorean Equation

$$16^2 + 63^2 = C^2$$
$$C = \sqrt{16^2 + 63^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.

$$\sin(\theta) = \frac{-63}{65}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.74$ meters, a frequency of 4.02 Hz, and an amplitude of 2.76 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.76 \sin(2\pi 4.02 t) + 7.74$$

or

$$y = 2.76 \sin(8.04\pi t) + 7.74$$

or

$$y = 2.76 \sin(25.26 t) + 7.74$$